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Mexico's Expanding Olive Industry

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Some Key Data on Mexico

People

Population: 70 million.
Geographic distribution: 60 percent urban, 40 percent rural.
Ethnic distribution: 60 percent Indian-Spanish (Mestizo), 30 percent American Indian, 9 percent Caucasian.
Mexico City's population: 13 million, including Federal District (world's largest city).
Education: Compulsory for 9 years. Literacy rate, 75 percent.

Economy

Gross domestic product: $74.3 billion (1977).
Inflation rate: 17 percent (1978), 18 percent (1977), 29 percent (1976).
Unemployment rate: 19 percent (1978), 20 percent (1977), 25 percent (1976).
Employment: 20 million, with 800,000 entrants annually.
Exports: $5.8 billion (f.o.b.) in 1978; $3.4 billion to U.S.; $1 billion in agricultural items.
Imports: $7.2 billion (c.i.f.) in 1978; $4.5 billion from United States; $900 million in agricultural items.

Agriculture

Total land area: 197 million hectares.
Forests: 73 million hectares (37 percent).
Pasture: 68 million hectares (35 percent).
Mountains and deserts: 28 million hectares (14 percent).
Crop area: 28 million hectares (14 percent).
Irrigated area: 5 million hectares (3 percent).
Leading crops in 1978 (hectares): Corn (8.1 million), dry beans (2 million), sorghum (1.1 million), wheat (850,000), sugarcane (445,000), safflower (370,000), cotton (354,000), coffee (320,000), barley (240,000), sesameseed (240,000).
Leading fruits and vegetables in 1978 (hectares): Oranges (168,000), tomatoes (71,000), potatoes (58,000), peppers (54,000), bananas (50,000), limes (44,000), grapes (40,000), watermelons (24,000), cantaloupes (23,000), onions (20,000), and olives (5,000).

Front cover: Harvesting olives in Baja California.

CALIFORNIA
SAN DIEGO
Chula Vista
San Ysidro
Tijuana
Tecate
Calexico
El Centro
MEXICALI
Imperial Dam
Yuma
ARIZONA
NEW MEXICO
Rio Colorado
UNITED STATES
MEXICO
GRAN DESIERTO
TUCSON
Ensenada
Punta Santo Tomas
Chapultepec
Puerto Santo Tomas
Santo Tomas
Ejido Erendira
San Vicente
Colonet
Cabo Colonet
Camalu
Colonia Guerrero
San Quintin
Bahia San Quintin
El Rosario
SIERRA JUAREZ
SIERRA PAIPAI
SIERRA SAN PEDRO MARTIR
BAJA CALIFORNIA NORTE
Nogales
NOGALES
Presa Cuauhtemoc
Rio Concepcion
Caborca
Rio Magdalena
SIERRA DE SAN ANTONIO
Presa Rodriguez
CIUDAD JUAREZ
EL PASO
TEXAS
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ISLA ANGEL DE LA GUARDA
SIERRA DE SAN BORJA
SIERRA COLUMBIA
ISLA TIBURON
HERMOSILLO
SONORA
Rio Sonora
Bahia Kino
Laguna Guerrero Negro
Bahia de Sebastian Vizcaino
Guerrero Negro
Laguna del Fuerte
SIERRA VIZCAINO
DESIERTO DE VIZCAINO
Rio Guaymas
Rio Trinidad
Presa Alvaro Obregon
GUAYMAS
Rio Yaqui
CIUDAD OBREGON
Presa Mocuzari
Rio Mayo
Huatabampo
CHIHUAHUA
CHIHUAHUA
Barranca del Cobre
Rio Urique
Rio Verde
Presa Miguel Hidalgo
El Fuerte
Rio Fuerte
SINALOA
Los Mochis
Rio Sinaloa
Guasave
Rio Evora Mocorito
Boca del Rio
Mocorito
Presa Lopez Mateos
Rio Culiacan
Rio Humaya
SIERRA ESPINAZO DEL DIABLO
Rio Tamazula
CULIACAN
DURANGO
Presa Sanalona
Rio San Gregorio
Rio San Lorenzo
Rio Elota
Rio Verde
Rio Piaxtla
Rio Presidio
Elota
DURANGO
MAZATLAN
Rio Baluarte
PACIFIC OCEAN
Gulf of California
Punta Santo Domingo
Santo Domingo
Boca Sto Domingo
Rio Sto Domingo
SIERRA DE LA GIGANTA
LLANO DE LA MAGDALENA
LA PAZ
LLANO DE LA PAZ
SIERRA DE SAN LAZARO
San Jose del Cabo
Cabo San Lucas
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Foreword

Mexico's olive industry is expanding at a rapid pace, spurred by accelerating production of table olives in the northwestern states of Sonora and Baja California. Growers in these states are increasing plantings and expanding processing capacity at an unprecedented rate.

Surplus production for export is developing, and, in years of U.S. crop shortfalls, some U.S. processors and distributors are importing table olives from Mexico to maintain their market outlets. As Mexico's olive industry expands, both raw and processed olive products will be exported.

Presently, most of Mexico's foreign trade in olives consists of shipments along the western U.S.-Mexican border. However, as Mexico's production mounts, the outlook for the 1980's and 1990's is for a sharp rise in exports of table olives and olive oil to the United States and Canada.

The purpose of this report is to describe Mexico's olive industry and the factors underlying its impact on the U.S. olive industry. The author is indebted to numerous Government and industry officials for information and assistance. Special appreciation is extended to David I. Rosenbloom, Assistant U.S. Agricultural Attaché, Mexico City; James H. Baldas, District Director, USDA's Animal and Plant Health Inspection Service, Plant Protection and Quarantine, Tijuana, Mexico; and Lic. Sergio Miranda Sotelo, Economic Officer, U.S. Consulate, Hermosillo, Mexico, for accompanying the author on his survey and providing information for this report.

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Foreign Agricultural Service

April 1980

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Mexico's Expanding Olive Industry

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Summary

Mexico is expanding its olive industry substantially, and may become a major world producer and exporter of table olives and olive oil sometime in the 1980's and continuing into the 1990's.

Major factors in the industry's expansion program include large-scale plantings of olive trees (particularly in desert areas of Baja California and Sonora), construction of new processing plants, and enlargement of existing processing facilities.

Although Mexico has never been a significant supplier of table olives and olive oil to the United States, producers plan to export a substantial share of their enlarged output to this market in 5-10 years, displacing a significant share of U.S. imports of table olives and olive oil from Spain and Italy. Production facilities for this purpose are being extensively upgraded.

The United States is a net importer of table olives and olive oil. In 1979, 36,926 metric tons[1] of table olives and 27,306 tons of oil, valued at $76 million and $45 million, respectively, were imported. Spain supplies over 80 percent of U.S. imports of table olives, the bulk of which are in the form of so-called "Spanish olives"—brined green fruit, often pitted and stuffed with pimentos. Italy and Spain supply 50 and 40 percent, respectively, of U.S. olive oil imports.

Introduction

Olives are well adapted to the arid climate of northern Mexico and have been grown there for more than 450 years. They were introduced to the country by Franciscan and Jesuit missionaries shortly after the conquest by Cortés. Missionaries brought olive seeds and cuttings from Spain and developed into what has become known as the Mission variety (*Oleo europaea, var. Mission*) that was planted throughout Mexico.

The first plantings are attributed to Brother Martín de Valencia, who in 1524 planted some trees near Mexico City. Some of these trees are still producing olives. Later, commercial olive groves were established in the states of Guanajuato and Michoacan, particularly in the Apatzingán area. During the ensuing two and a half centuries, olive production rose to a point where it fulfilled domestic demand for olive oil and permitted shipments to other Spanish colonies—in competition with Spain's olive oil shipments.

This competition had become so important by 1774 that King Carlos III of Spain issued an order prohibiting further plantings of olive trees in Mexico. However, competition from existing olive growers continued, and in 1777 Carlos issued a decree ordering destruction of all olive groves except those of church property, thus ending Mexico's first commercial olive industry.

Today, the Mexican olive industry is centered in Baja California and the neighboring state of Sonora. Olive groves in this region owe their origin to Father Eusébio Francisco Kino, a legendary Jesuit who founded many missions in Mexico's Pacific Northwest during the 17th century. Under his leadership, cattle ranching and grain farming were started, while Mission olives (and Mission variety wine grapes) were planted to produce olive oil. Many of these original Mission trees are still producing, particularly in Baja California.

In 1769, during an expedition by Don Joseph de Galvéz to rediscover the port of Monterrey, Franciscan priests brought olive seeds and cuttings to the San Diego Mission from San Blas, Nayarit. This proved to be the origin of the present-day olive industry in California.

Olives are virtually the only commercial crop that will grow without irrigation in the deserts of Sonora and Baja California (although most olive groves are irrigated to produce larger sized fruit). The olive areas in northern Sonora—around the cities of Caborca and Hermosillo—receive only 100-200 millimeters (4-8 inches) of annual rainfall. Baja California's olive area—principally along the northern Pacific coast—has an average of 200-300 millimeters (8-12 inches) of annual precipitation.

Sonora's rainfall usually arrives during July and August, while Baja California's rainy season is from December through March. Sonora has light frosts in the winter and extremely hot summers, while Baja California's coastal areas have moderate temperatures year-round.

Adverse weather—particularly in Baja California—is a significant production problem. Lack of rainfall and warm winters frequently cut crop yields to half of normal levels in Baja California. For this reason, olive production is shifting to Sonora and to cooler parts of Baja California, where irrigation water is available and winter temperatures are below 10°C (50°F), which is necessary for olive trees to form flowers.

[1] Note: All tons are metric unless otherwise specified.

Area and Varieties

Approximately 95 percent of Mexico's olive area is centered in Baja California and Sonora. Baja California has approximately 5,000 hectares of bearing olive groves and another 1,000-2,000 of nonbearing trees. Sonora has 2,000 hectares planted but only about 400 hectares of fruit-bearing trees. Other minor production zones are in the States of Durango, Guanajuato, and Aquascalientes.

Planted area in Baja California expanded at an average 100 hectares annually during 1975-79, while Sonora's annual plantings were 300-500 hectares.[2] If these planting rates continue as expected, Mexico's olive producing area will exceed that in the United States in 10-20 years.

Because Baja California's coastal valleys frequently have warm winter weather—which dramatically reduces olive production—new plantings there have been in the cooler inland areas. Sonora's new plantings are in new irrigation areas, primarily around Caborca.

Today, table olive varieties planted in Mexico follow the same pattern as those of Southern California. Until the Mexican Revolution of 1910-20, the Mission olive was the predominant type planted in that country for table use and oil extraction. Although the Mission variety continues to be the best variety for oil extraction and continues to be grown in Baja California primarily for this purpose, it has been largely replaced as a table olive variety because of its small-sized fruit.

Since the 1920's, plantings have been primarily of the Manzanillo variety, although there have been some trial plantings of other varieties. Manzanillo fruits are larger than Missions and have a much higher flesh-to-pit ratio; moreover, they are easily processed and have an oil content high enough to warrant extraction from small, frozen, or culled fruits.

During the late 1960's, commercial plantings of Sevillanos (Queens, or Gordales) started because of the substantial premiums paid by processors for these very large fruits.

Later, however, Mexican processors found this variety more difficult to process, and its fruit quality was often somewhat lower than that of the Mission and Manzanillo varieties (although with proper treatment a satisfactory table olive product can be obtained). Also, the yields are generally lower than those of the other varieties, and the oil content is not high enough to justify oil extraction.

For these reasons, area devoted to Sevillano is relatively small compared with that of Manzanillos, with plantings located only near a few processors in Baja California that produce large-size, specialty type olives—Mammoth, Giant, Jumbo, Colossal, or Super-Colossal grade sizes.

[2] The removal of old olive trees offsets some of these area increases in Baja California.

The two other principal table varieties grown in California—Ascalano and Barouni—are not commercially grown in Mexico. The Barouni variety, grown primarily in northern California, does not yield well in Mexico because of the hot climate, while the Ascalano has very tender fruit that is easily bruised and not suited to green pickling for Spanish-type olives because of salt-shrivel during fermentation.

During the 1980's, the Manzanillo variety will continue to account for the bulk of the new plantings. Sevillano plantings may also increase as demand for large-size table olives rises. However, processors are more interested in obtaining new varieties that are suitable for both table and oil use and that grow well with minimal irrigation.

Olive trees are generally planted on the square system, with rows at 90-degree angles and trees—averaging 10 meters apart—planted 100 per hectare. Earlier plantings were 6-8 meters between trees, but this was much too close and yields from these trees declined rapidly because of shading on bearing surfaces and root competition. Standard planting distances vary from 9 to 12 meters between trees, with Manzanillo trees planted the closest together. Missions and Sevillanos are spaced further apart.

Plantings are also made in accordance with the type of irrigation used. Many of Sonora's plantings are in 10-by-10-meter squares with raised contour levees so that each tree can be flood-irrigated with minimal water loss. With the furrow system of irrigation, the channels are laid out before planting the trees. However, when the drip irrigation system or the movable, drag hose line system (sprinkler head irrigation method) are utilized, the groves are generally planted first and the watering system installed afterward.

Yields

Until 1977, yields generally were highest in the large olive groves of northern Baja California. However, yields in Sonora increased sharply in 1978 and 1979 as bearing trees 20-30 years of age came into full production and intensive cultural practices began to pay dividends.

Baja California's bearing trees range in age from 10 to 400 years, but most are 30 to 50 years old—the optimal bearing age if trees are well maintained. Some Mission orchards 200 to 400 years old still bear above-average crops, particularly in years of heavy rainfall or where frequent irrigation is available. At the Baja California Mission de Santo Thomas (where all trees are under constant ditch irrigation from local springs), 300-year-old trees average 120 kilograms (250 pounds) of olives per tree, compared with 45 kilograms (100 pounds) for 20-year-old trees.

In years with favorable weather, such as in 1971, Baja California's overall yields have averaged 40 kilograms per tree, or 3.2 tons per hectare. However,

during 1973-76 period, warm winters and below-average rainfall resulted in yields of only about 1.5 tons per hectare, or 14 kilograms per tree. Nevertheless, many orchards in Baja California are approaching an optimal bearing age of 30-50 years and heavy rainfall and favorable temperatures in 1979 caused yields to revive to at least 20 kilograms per tree, or over 2 tons per hectare.

In Sonora, yields are also advancing with the increase in age of the olive groves and now are the highest in Mexico. During the 1960's, production per tree averaged only 5 kilograms, but average yields now exceed 80 kilograms per tree. Sonora's yields jumped from 1 to 8 tons per hectare in 1977 as the new orchards came into full production and advanced technology imported from the United States was utilized. In well-maintained older olive areas, yields are about 100 kilograms per tree, or 10 tons per hectare (4 tons per acre), which is near average yields in the United States.

Sonora's yields now are about four times higher than Baja California's yields—a result of the adoption of U.S. production practices in Sonora—while Baja California continues to use less efficient cultural practices. Although Sonora's yields are now 8-9 tons per hectare (about 3.5 tons per acre), this is still well below California's 10-20 ton yields. Sonora's growers expect average yields to continue rising and reach U.S. levels by 1990 as their trees reach mature age.

Cultural Practices

Cultural practices are often the most important factor affecting production—particularly in Sonora, where intensive use of U.S. technology boosts yields substantially. Irrigation, fertilization, cultivation, pruning, fruit thinning, and spraying practices have an important impact on crop production, along with rainfall patterns, winter temperatures, and the natural tendency of olive trees to bear alternatively heavy and light crops.

The timing and amount of irrigation water used is critical in producing a crop of large-size olives for table use. In Baja California, orchards are generally irrigated by ditch flood, fixed high-volume sprinkler heads, or low-volume, movable drag hose lines. Irrigation in Baja California (using any of these methods) generally is performed two to four times annually, with younger trees receiving additional waterings. However, most of Baja California's trees are on dryland farms, which often accounts for the low yields in this region.

Olive groves in Sonora are usually irrigated from four to eight times annually, using flood irrigation with contour levees, or with ditch irrigation. Older olive groves are flooded four times a year, twice in the spring, and twice in the early fall, while younger trees are irrigated about eight times a year to promote plant growth.

Drip irrigation—the most efficient water usage system—is increasing in use because of the rising cost of obtaining irrigation water. Drip waterings are applied one to five times monthly—depending on the weather, phase of the growing season, and age of the trees.

Total water usage in Sonora's olive orchards is generally 3,500-4,500 cubic meters (2.5-3 acre-feet) per hectare annually, while in Baja California, water usage varies widely, generally from zero to 3,500 cubic meters (zero-2.5 acre-feet) per hectare.

Water may cost $80-$100 per hectare ($30-$40 per acre) if it is obtained from the Mexican Government, although most irrigation water comes from private wells. A deep well costs about $20,000 to drill and the equipment may last 10 to 20 years. These wells irrigate 50-100 hectares under drip irrigation, but only 30-50 hectares under ditch or flood irrigation.

Cultivation practices usually entail the disking in of winter weeds, floating or harrowing, and furrowing-out after every second or third irrigation during the summer. The soil is disked and floated prior to spraying or harvesting if the weed cover interferes with these operations. Disking and harrowing costs are roughly $30 and $20 per hectare, respectively, with tractor and equipment usage being the major part of this cost. Small orchards generally omit this practice, while large operations disk and harrow to make water usage more efficient.

Pruning is critically important to mature bearing trees to boost yields and minimize the natural tendency for olives to produce alternately light and heavy crops. Nonbearing trees are also pruned every other year to develop good limb structure that can sustain heavy crops and resist strong winds without limb breakage. Normal pruning costs about $20 per hectare ($8 per acre), with labor accounting for virtually all this cost.

Alternative bearing is a major problem for table olive producers in both Mexico and the United States, and has a direct impact on profits. In years of bumper crops, for example, the fruits may be so small at maturity that they are not suitable for table olives and are left on the tree for later harvesting as oil olives.

Fruit thinning in Mexico is normally performed by hand. However, large orchards usually are spray thinned (if need be) with the hormone naphthaleneacetic acid (NAA), which increases the normal immature fruit drop. Thinning by hand is generally performed from mid-June to early July, while spray-thinning is done during late May to early June. Hand thinning costs about $50 per hectare ($20 per acre), with labor accounting for most of the cost.

Mexico's large-scale growers indicate that thinning of excessive fruit provides the following benefits:

- Reduces the tendency for alternative bearing;
- Increases average yields over a period of years;

• Produces larger fruit with greater flesh-to-pit ratio;

• Increases the oil content of the fruit;

• Promotes earlier fruit maturity with less olive shrivel;

• Reduces limb breakage and enlarges the production of more fruiting wood for the next season's crop.

Fertilizers are applied in the winter to stimulate flower development and enhance the fruit set. About 45 kilograms per hectare (40 lb per acre, or 0.5-1.0 lb per tree) of nitrogen fertilizers are applied in December or January. If manure is available, it is applied in the fall. After heavy bearing—when lower yields are expected for the next crop—nitrogen fertilizers are often applied in larger volume to offset the alternate-year bearing characteristic.

Most inorganic fertilizers cost $300-$400 per ton and are supplied by PEMEX and FERTIMEX (Mexican firms associated with the national Government).

Insect pests and diseases in Mexico are similar—if not identical—to those that plague olive trees in the United States. The three major pests are olive scale (*Parlatoria oleae* [Colvee]), oleander or ivy scale (*Aspidiotus hederae* [Vallot]), and the black scale (*Saissetia oleae* [Bern]), which are treated with the same oil-based insecticide sprays commonly used in California (i.e., malathion and parathion). Spraying costs about $50 per hectare ($20 per acre), depending on the extent of infestation.

The three primary diseases of Mexico's olives are identical to those of California: Peacock spot (*Cycloconium oleaginum* Cast.), olive knot (*Bacterium savastanoi* E.F.S.), and the well-known *Verticillium alboatrum* R. and B. Proper pruning and spraying with fungicides, such as Benlate and Faltan, controls most of the peacock spot problems; olive knot is controlled by removing the galls or knots, *Verticillium* is controlled by uprooting diseased trees and prohibiting the planting near olive groves of alternative host plants such as cotton, tomatoes, potatoes, and other vegetables.

Harvesting

Olives for table use are harvested from mid-September to mid-November, and olives for oil are usually harvested 1 or 2 months later, depending on weather, variety, and needs of the canneries. Harvesting begins when the fruit color changes from dark green to a light green-straw yellow and the flesh becomes soft. With bumper crops, growers generally spot-pick the largest and ripest fruit, then harvest the remainder as oil olives. Some growers pick over the olive groves from three to five times, taking only the larger, mature olives. The small fruit is left until January, when the oil content reaches its maximum level; oil content increases sharply from September to January.

Most large olive grove owners in Sonora sell their fruit on the tree with the processors providing the harvest labor. In contrast, the majority of the trees in Baja California are in small backyard orchards, and the growers and their families pick and deliver the olives to the processing plants.

Harvesting is the largest component in the cost of production for most olive growers. Two to five workers, skilled in using ladders and picking only the ripe fruit, are required to harvest the fruit from a hectare of olive trees. Skilled workers earn about $8 per day, while farm workers garner $6 a day—the minimum wage. Depending on location and time involved, the cost of harvesting 1 hectare of olives varies between $100 and $200.

Long-distance hauling of raw fruit to the processing plant is a serious problem for growers in Baja California because of the rapid deterioration of fruit quality between the time of harvest and brine storage. Baja California's mountainous terrain and limited road system can cause shipping problems, while Sonora has an adequate road network. The fruit is shipped to processors immediately after harvesting, and growers often sustain financial loss if the crop is not in brine storage within 12 hours after being picked. Some growers and processors have fruit shipped at night to avoid deterioration from "sweating" or "heating," while others provide brine storage close to orchard centers.

Production

The production level of olives in Mexico during 1974-76 was relatively low, averaging only 8,400 tons annually because of adverse weather conditions. However, the 1979 crop was up sharply to 14,000 tons, of which 10,000 tons were harvested in northern Baja California, 450 tons in the southern part of the state, and 3,500 tons in Sonora.[3]

In both Baja California and Sonora, growers garner about 9 pesos per kilogram (US $395 per ton). In Sonora, the average orchard yields 8.5 tons per hectare, valued at $3,400, while in Baja California an orchard may average 2 tons per hectare, valued at $800. Although Sonora's groves cost more to maintain because of intensive cultural practices, the higher crop value per hectare compensates for the higher cost of production.

Processing

There are seven olive processing plants in Baja California—five producing both fruit and oil and two producing only oil. Three of the five table-olive

[3] The 1978 and 1979 production estimates are not official statistics from the Mexican government, but are based upon reports from the trade.

processors are packing Spanish green olives in glass jars for retail distribution, while the other two sell olives in bulk to bottling companies for repacking in retail-size containers.

During recent years, about 20 percent of the output of Baja California's olive processors has been in the form of oil and 80 percent as table olives (finished-product basis). Generally, only one-third to one-half of Baja California's olive crop is suitable for fruit production and the rest is crushed for oil. Although olive oil is pressed from overripe and culled fruit not suitable for table use, a high-quality, low-acid virgin cold-pressed oil can be obtained. The best oil yields range from 17 to 21 percent by weight, but the average is 15 percent.

Because Sonora's output of olives has been relatively small, the growers there were entirely dependent on processors in Baja California for a market outlet until 1978. However, olive growers in the Caborca area of Sonora have recently formed a producer group, the Association of Olive Producers of Caborca, and have established an olive processing plant to meet their expanding needs. This processing operation primarily produces brined table olives of the Spanish green style, while substandard fruit is crushed for oil.

Of the 1978 Baja California olive crop of 7,000 tons,[3] processors produced about 500 tons of oil and 3,000 tons of table olives. In that year, Sonora's crop was sold to processors in Baja California and included in their output of finished products. However, starting in 1979, Sonora's crop is being processed primarily in Caborca.

Mexico's green brined table olives are similar to California's black table olives, except that the Mexican product is not oxidated to turn black as is the case in California. The brined olives are processed in the same manner as the black ripe olives, with similar cooking times and temperatures, and canned in the same brine solution. Mexico's green and California's black brined olives are available whole, pitted, or stuffed.

Mexico also has a type of Spanish green olive processed by neutralization, leaching, and fermentation. Spanish-style olives are prepared from fully developed (but not ripe, or black) fruit, which is light green to straw-yellow in color.

Upon arrival at the processing plant, raw olives are washed, sorted, and stored temporarily in 5-liter buckets containing about 30 kilograms (65 pounds) of fruit and brine solutions. Olives are then taken from temporary storage and soaked in a curing solution of sodium or potassium hydroxide (usually for 4 to 12 hours) to remove most of the fruit's bitter flavor. Lye penetration is carefully observed by frequently cutting fruit to the pit with a knife, with the depth of penetration indicated by the yellowish-green color of the lye-treated flesh.

After sufficient lye penetration, the excess caustic solution is washed and leached from the olives by several applications of cold water during a 24-to-48-hour period. The fruit is then placed in 1- or 2-ton containers (called botellas in Mexico or bottles in California), covered with a salt brine solution, and fermented for a period of from 2 to 12 months.

Fermentation takes approximately 2 months in warm weather and up to 12 months in cool weather. During the fermentation or curing process, the olives become firm, salty, and light yellowish green in color and take on the characteristic flavor and aroma of the Spanish green olive. When fermentation is complete, the containers are drained of fluids, completely filled with new brine that includes a preservative, then sealed and stored until needed. Only a few processors market olives in the cloudy, used brine, which has a richer and more subtly complex flavor than the colorless new brine, because Mexican consumers prefer the clear brine.

Olive processors are beginning to produce Spanish-style olives that are pitted with equipment imported from California and stuffed with locally produced minced pimentos and occasionally pearl onions. Some are also sold pitted but not stuffed. However, most olives are marketed in the inexpensive unpitted form.

Presently, Mexico has an annual processing capacity of 5,000 tons of fruit and 1,500 tons of oil. By 1985, processors expect to double these capacities to 10,000 tons of fruit and 3,000 tons of oil. In the late 1980's this processing capacity is expected to reach 15,000 tons of fruit and 5,000 tons of oil. Much of the expansion is expected to be in specialty table-olive products.

Processors are undertaking significant modernization programs and are also installing new pressing equipment for oil outturn. Generally, older olive pressing machines produce 15 tons of oil during a 16-hour cycle, using 4,000 p.s.i. (pounds per square inch) of pressure. The new equipment turns out 40-50 tons in a 16-hour period, utilizing 15,000 p.s.i. of pressure.

Although black olives are not produced on a regular commercial basis in Mexico at the present time, most processors plan to buy oxidation and other equipment to produce black olives in the near future. Several processors expect to be producing substantial quantities of black table olives in 3-5 years and marketing them as part of their line of specialty olive products.

Marketing

Processors market about half of their table olives as unpitted fruit, with the bulk of the remainder sold pitted and stuffed with pimentos. Some fruit is marketed pitted, unstuffed. However, because of the large supply of relatively low-priced locally grown pimentos, most processors have the pitted olives stuffed to realize higher sales value for the product.

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1. This olive grove near Caborca, Sonora, draws sustenanc gravity-flow irrigation water.

2. Up to 50 tons of olive oil can be produced in two 8-hou from presses such as this.

3. Oil olives ready for the press.

4. Table olives in temporary brine solution.

5. Fermentation botellas, each containing 1 to 2 tons of olives. During fermentation, the brine solution is changed regularly.

6. A moment of rest for a worker at a processing plant.

7. Black olives for oil are examined on arrival at the plant.

8. Workers on a processing line for table olives.

9. Spanish-style table olives and olive oil products at an ejido in Baja California.

10. Inspecting table olives in fermentation botellas in Sonora.

11. Manzanillo olive trees planted within contour levees in Sonora.

12. Workers at a Sonora processing plant sorting olives of table-fruit quality.

Mexico uses California's grades for Spanish-style olives, which also apply to California-style fruit. Most are Grade B (or choice), some are Grade A (or fancy), and a few are Grade C (or standard). Factors determining grade include color, uniformity of size, absence of defects, and character—firmness, crispness, texture, and the condition of the epidural tissue.

Mexico's olives usually are sized as small (122-140 olives per pound), medium (105-121 count), or large (91-104 count), although some are sized as extra large (76-90 count) and mammoth (65-75 count). Olives are sized before and after processing so that a uniform product can be produced.

Most olive oil is marketed as table (virgin) oil, with consumers preferring the lighter color grades of low-acid, cold-pressed oil. Overall acidity and fatty acid content of the oil varies tremendously from one location to another and from one year to the next. Since only affluent Mexicans buy olive oil, they tend to buy according to brand, rather than price.

Processors in Baja California and Sonora sell most of their output to wholesalers in central Mexico. Mexico City, Guadalajara, Tijuana, and Monterrey are, in descending order of importance, the leading markets for table olives and olive oil. However, Mexican processors are exploring the possibilities of exporting table olives and oil to the United States through California's olive processors and distributors.

Foreign Trade

The foreign trade sector of Mexico's olive industry is—despite its relatively small size—important to the U.S. olive industry because of its location and rapid expansion.

Mexico currently exports olives to the U.S. market on an irregular basis. Annual exports have amounted to only about 300 tons of table olives, valued at $50,000 during years of U.S. crop shortfalls.

Until the 1970's, Mexico imported table olives and olive oil—principally from Spain—to supplement its domestic production. Recently, however, as olive output has increased in Sonora and Baja California, Mexico has become a net exporter of olives.

Nevertheless, Mexico's exports of table fruit and olive oil are still small relative to overseas shipments from Spain, Greece, and Italy.

Mexico's olive producers have made some shipments of fresh and unprocessed olives in brine to the United States, but generally Mexico's raw and brined table fruit has been purchased by U.S. processors and distributors only when California's products are in short supply.

During such times, U.S. processors go to Mexico and buy olives on the trees or directly from Baja California processors. However, these shipments probably will rise sharply as Mexico's olive production increases and the fruit quality improves.

Mexico has exported some pitted and stuffed green olives. Such processed shipments usually encounter strong competition from Spain's exports to the United States.

Nevertheless, as Mexico's table olive quality improves, its location advantage over Spain in shipping to the United States will probably aid in displacing some of Spain's olive exports to the United States.

Mexico does not export significant amounts of olive oil, as this commodity normally goes directly to the expanding domestic market. Sometimes, Mexico imports olive oil from Spain to satisfy demand when domestic production is at low levels. However, Mexico's olive oil output in the future should expand sharply and some of this additional production may be channeled into the export market, displacing European exports to the U.S. market.

Outlook

As olives are one of the few crops that grow well in the deserts of Sonora and Baja California with little or no irrigation, production is expected to expand sharply as growers increase plantings. Mexico's total olive area and production are expected to double in the 1980's and triple during the 1990's. Although limited water supplies will keep average olive yields—particularly in Baja California—below those of the United States (where all trees are irrigated frequently), it is this water restriction that will encourage Mexico's growers to change from such high-water-usage crops as grains and cotton to olives.

Solely on the basis of the entry into production of the present number of nonbearing trees, production could rise to 25,000 tons by 1985 and more than 50,000 tons by 1990. The expected rise in production, combined with the growing investment in processing facilities, will result in increasing supplies of table olives and olive oil in Mexico that are not expected to be absorbed by the domestic market. Thus, there will be surplus finished products to be exported—probably to the United States if U.S. prices are moderately above Mexico's. Production of table olives and oil from northwest Mexico will then be in greater direct competition with California's olive industry.

Olives: Production, Value, and Utilization, California, 1963-79

Year	Production[1]	Season average price per ton[2]	Value	Utilization		
				Crushed for oil	Canned	Other[3]
	Short tons	*Dollars*	*1,000 dollars*	*Short tons*		
1963	57,000	198.00	11,286	7,500	39,100	9,600
1964	54,000	139.00	7,506	6,200	37,500	9,400
1965	50,000	219.00	10,950	4,300	37,800	7,300
1966	63,000	241.00	15,183	4,800	45,500	11,900
1967	14,000	384.00	5,376	1,470	10,230	2,000
1968	86,000	368.00	31,648	4,600	62,800	18,000
1969	70,000	329.00	23,030	5,200	51,700	12,500
1970	52,000	247.00	12,844	4,100	39,200	8,100
1971	55,000	148.00	8,140	4,900	39,600	9,800
1972	24,200	415.00	10,043	700	20,000	3,300
1973	70,000	392.00	27,440	4,300	54,300	10,700
1974	58,500	434.00	25,389	3,100	46,700	7,800
1975	67,000	336.00	22,512	3,800	53,300	9,000
1976	80,000	330.00	26,400	3,700	65,500	10,200
1977	43,000	403.00	17,329	2,300	32,300	7,800
1978	126,000	303.00	38,178	7,300	99,100	18,800
1979[4]	59,000	398.00	23,482	2,900	52,300	3,400

[1] Production is the quantity sold or utilized. [2] Quantities processed are priced at the equivalent processing plant door level. [3] Includes Spanish, Greek, and Sicilian styles, and chopped, minced, brined, and other cures. [4] Preliminary.

Economics, Statistics, and Cooperatives Service—Crop Reporting Board. About 40 gallons of oil are obtained from 1 ton of olives in California. Data for 1944-62 in *Agricultural Statistics, 1972*, table 339.

Olives: U.S. Imports, 1974/75-1978/79 (Nov.-Oct.)

(Metric Tons)

Item	1974/75	1975/76	1976/77	1977/78	1978/79
Olives, fresh:					
Greece	—	—	11	—	13
Mexico	—	—	—	2	—
Spain	—	—	—	—	1
Other	3	—	—	—	—
Total	3	—	11	2	14
Olives, in brine, excluding ripe and pitted, green in color, canned:					
Greece	1,553	2,035	2,575	1,791	1,327
Mexico	—	—	—	—	—
Spain	2	11	2	59	5
Other	38	206	275	103	173
Total	1,593	2,252	2,852	1,953	1,505
Olives, in brine, not ripe:					
Greece	423	391	436	576	387
Mexico	—	—	—	329	224
Spain	4,638	4,975	4,421	5,228	3,242
Other	89	186	186	280	186
Total	5,150	5,552	5,043	6,413	4,039
Olives, in brine, ripe, not pitted, green in color, canned:					
Greece	189	247	361	283	303
Mexico	—	—	—	—	4
Spain	18	—	1	9	—
Other	51	60	45	62	18
Total	258	307	407	354	325
Olives, in brine, ripe, not pitted, NES:					
Greece	42	58	60	20	30
Mexico	—	—	—	—	—
Spain	291	417	160	126	129
Other	25	49	40	36	47
Total	358	524	260	182	206
Olives, in brine, pitted:					
Greece	7	11	13	3	25
Mexico	59	90	—	—	—
Spain	2,196	2,091	2,204	2,711	4,168
Other	41	104	103	149	36
Total	2,303	2,296	2,320	2,863	4,229
Olives, in brine, stuffed:					
Greece	—	58	28	—	2
Mexico	69	4	—	6	—
Spain	23,888	29,415	27,167	33,892	21,879
Other	458	169	172	77	191
Total	24,415	29,646	27,367	33,975	22,072

(Continued)

Olives: U.S. Imports, 1974-75-1978/79 (Nov.-Oct.)—*Continued*

(Metric Tons)

Item	1974/75	1975/76	1976/77	1977/78	1978/79
Olives, dried:					
Greece	8	62	5	4	5
Mexico	—	—	—	—	—
Morocco	439	323	589	397	576
Spain	—	—	75	51	—
Other	—	1	—	5	5
Total	447	386	669	457	586
Olives, otherwise prepared or preserved, NSPF:					
Greece	264	495	722	620	935
Mexico	—	—	—	—	—
Spain	—	—	3	18	1
Other	79	117	127	96	160
Total	343	612	852	734	1,096
Olives, all categories:					
Greece	2,486	3,357	4,211	3,297	3,027
Mexico	128	94	—	337	228
Morocco	439	323	589	397	576
Spain	31,033	36,909	34,032	42,094	29,425
Other	784	892	949	808	816
Total	34,870	41,575	39,781	46,933	34,072

— Indicates negligible or none.

Source: U.S. Bureau of the Census.

U.S. Imports of Olive Oil (Edible and Inedible), by Country of Origin,
Annual 1972-77, January/February 1979

(In metric tons)

Country of origin	1972	1973	1974	1975	1976	1977	1978	1979[1]
Edible:								
Argentina	0	241	228	112	3	46	115	17
France	68	328	528	1,140	534	109	141	263
Greece	694	377	245	473	510	278	504	611
Italy	11,419	9,802	10,389	9,465	12,815	10,559	14,321	14,497
Portugal	288	305	297	340	242	273	401	389
Spain	12,670	13,671	9,079	9,070	13,141	10,391	11,130	10,774
Tunisia	5,279	1,900	2,709	674	738	1,065	1,300	670
Turkey	—	350	685	0	0	0	0	0
Others	21	222	42	320	268	[2]1,802	127	25
Total[3]	30,439	27,196	24,202	21,594	28,252	24,522	28,038	27,246
Inedible:								
Portugal	48	21	0	0	0	0	0	0
Spain	97	80	20	33	9	9	0	0
Other	10	0	[4]142	7	42	[5]102	[6]49	[7]60
Total[3]	155	101	162	40	50	112	49	60
Grand total[3]	30,594	27,296	24,364	21,634	28,303	24,633	28,087	27,306

[1] Preliminary. [2] Includes 1,530 tons from Malaysia. [3] Totals may not add due to rounding. [4] Includes 75 tons from France and 58 tons from Turkey. [5] Includes 14 tons from France and 88 tons from Italy. [6] Includes 49 tons from Italy. [7] Includes 15 tons from France and 45 tons from Italy.

Source: U.S. Department of Commerce.

Olives: Mexico's Area, Yield, and Production by States, 1960-1979

Year	Area				Yield				Production			
	Baja California		Sonora	Mexico[1]	Baja California		Sonora	Mexico[1]	Baja California		Sonora	Mexico[1]
	Norte	Sur			Norte	Sur			Norte	Sur		
	Hectares				*Kilograms per hectare*				*Tons*			
1960	2,000	150	50	2,223	1,050	1,200	500	1,058	2,100	180	25	2,353
1961	2,139	177	66	2,600	1,547	1,215	985	1,420	3,310	215	32	3,691
1962	2,212	190	67	2,708	1,713	1,368	448	1,575	3,790	260	30	4,266
1963	2,970	191	72	2,794	1,294	1,450	417	1,563	3,844	277	30	4,367
1964	2,302	195	82	2,895	3,027	1,503	402	2,612	6,968	293	33	7,562
1960-64 Avg.	2,325	181	67	2,644	1,721	1,354	448	1,682	4,002	245	30	4,448
1965	2,348	456	75	3,107	3,000	2,500	600	2,706	7,044	1,140	45	8,407
1966	2,374	489	36	3,126	3,000	2,301	500	2,708	7,122	1,125	18	8,464
1967	2,416	557	41	3,378	3,000	2,101	610	2,591	7,248	1,170	25	8,754
1968	2,454	724	37	3,593	3,000	2,500	514	2,653	7,362	1,810	19	9,532
1969	2,481	718	83	3,667	3,300	2,201	602	2,771	8,187	1,580	50	10,161
1965-69 Avg.	2,415	589	54	3,374	3,061	2,317	574	2,686	7,393	1,365	31	9,064
1970	2,495	703	104	3,655	3,100	2,300	700	2,679	7,735	1,617	73	9,790
1971	2,516	200	141	3,240	3,237	2,000	2,030	2,922	8,144	400	286	9,467
1972	3,712	200	163	4,479	3,071	2,500	1,450	2,797	11,400	500	236	12,527
1973	3,691	200	163	4,449	2,075	2,700	1,740	2,025	7,659	540	284	9,010
1974	4,579	356	180	5,492	1,341	1,685	1,000	1,389	6,170	600	180	7,631
1970-74 Avg.	3,403	332	150	4,263	2,416	2,202	1,413	2,272	8,222	731	212	9,685
1975	4,600	570	182	5,596	1,406	1,035	1,098	1,363	6,470	590	200	7,630
1976	4,813	293	195	5,570	1,860	573	1,000	1,746	8,952	168	195	9,728
1977	4,625	106	262	5,299	2,216	2,302	8,782	2,498	10,250	244	2,301	13,236
1978[2]	5,000	300	300	5,900	1,400	500	8,000	1,695	7,000	150	2,400	10,000
1979[2]	5,000	300	400	6,000	2,000	1,500	8,750	2,333	10,000	450	3,500	14,000
1975-79 Avg.	4,808	314	268	5,673	1,775	1,019	6,414	1,925	8,534	320	1,719	10,919

[1] Includes other states. [2] FAS estimates.

Source: Secretaría de Agricultura y Recursos Hodraulicos, Dirección General de Economía Agricola (DGEA, SARH).

Olives: Mexico's Grower Prices and Value of Crop, by States, 1960-1979

Year	Grower Prices								Value of Crop			
	Mexican Pesos Per Kilogram				U.S. Dollars Per Ton				U.S. Dollars			
	Baja Calif.		Sonora	Average Mexico[1]	Baja Calif.		Sonora	Average Mexico[1]	Baja Calif.		Sonora	Total Mexico[1]
	Norte	Sur			Norte	Sur			Norte	Sur		
	Pesos				*Dollars*				*1,000 Dollars*			
1960	2.40	3.00	3.50	2.42	192	240	280	194	403	43	7	456
1961	2.68	3.40	3.75	2.74	214	272	300	219	708	58	10	808
1962	2.80	3.00	3.75	2.58	200	240	300	206	758	62	9	879
1963	2.80	3.50	3.85	2.86	224	280	308	229	861	78	9	1,000
1964	2.86	3.62	3.86	2.90	229	290	309	232	1,596	85	10	1,754
1960-64 Avg.	2.70	3.30	3.74	2.70	212	264	299	216	865	65	9	979
1965	2.90	3.70	3.70	3.02	232	296	296	242	1,634	337	133	2,034
1966	2.92	3.00	3.85	2.93	234	240	308	234	1,667	270	55	1,981
1967	2.60	2.70	3.50	2.63	208	216	280	210	1,508	253	70	1,838
1968	2.60	2.75	3.55	2.64	208	220	284	211	1,531	398	54	2,011
1969	3.00	3.50	3.87	3.08	240	280	310	246	1,965	422	15	2,500
1965-69 Avg.	2.80	3.13	3.69	2.86	224	250	296	229	1,661	336	65	2,073
1970	2.80	3.50	4.00	2.93	224	280	320	234	1,733	453	23	2,291
1971	3.00	3.50	4.05	3.07	240	280	324	246	1,955	112	93	2,329
1972	3.09	2.50	4.45	3.15	247	200	356	252	2,816	100	84	3,157
1973	3.25	3.00	4.70	3.33	260	240	376	266	1,991	130	107	2,397
1974	3.80	5.00	12.00	4.62	304	400	960	370	1,876	240	173	2,823
1970-74 Avg.	3.19	3.50	5.84	3.42	255	280	467	274	2,074	207	96	2,599
1975	3.80	8.00	6.30	4.27	304	640	504	342	1,967	378	101	2,609
1976	6.50	7.94	6.30	6.49	286	350	278	286	2,560	59	54	2,782
1977	6.50	10.00	5.06	6.28	286	441	223	277	2,932	108	513	3,666
1978[2]	8.00	9.00	8.00	7.80	352	396	352	344	2,464	59	845	3,440
1979[2]	9.00	9.00	9.00	9.00	395	395	395	395	4,000	200	1,400	5,500
1975-79 Avg.	6.76	8.79	6.93	6.77	325	444	350	329	2,785	161	583	3,599

NOTE: One U.S. dollar equalled 12.5 pesos prior to 1977, 22.7 pesos from 1977 through 1978, and 22.8 in 1979.

[1] Includes other states. [2] FAS estimates.

Source: Secretaría de Agricultura y Recursos Hidraulicos, Dirección General de Economía Agricola (DGEA, SARH).

Table Olives: World Production, Crop Years 1974/75-1978/79

(In 1,000 metric tons)

Area and country	1974/75	1975/76	1976/77	1977/78	1978/79[1]
North America					
Mexico	7.2	7.6	7.4	8.5	8.9
United States	49.4	58.1	68.0	50.0	55.0
Total	56.6	65.7	75.4	58.5	63.9
South America					
Argentina	22.5	29.0	25.0	29.0	32.0
Brazil	1.0	1.0	1.0	1.0	1.5
Chile	4.0	4.0	3.0	3.5	4.0
Peru	10.5	10.5	10.0	11.7	12.0
Total	38.0	44.5	39.0	45.2	49.5
Europe					
Cyprus	.7	3.0	1.0	2.0	1.8
France	2.4	2.4	2.9	2.4	2.0
Greece	67.3	95.7	54.1	69.0	83.0
Italy	76.4	80.0	45.0	91.0	75.0
Portugal	18.2	17.3	17.1	20.2	21.0
Spain	93.0	142.0	177.4	164.0	183.0
Turkey	145.0	118.0	150.0	93.0	160.0
Yugoslavia	.2	.7	.6	.7	.8
Total	403.2	459.1	448.1	442.3	526.6
Middle East					
Israel	15.0	3.5	14.5	4.8	16.0
Jordan	6.7	10.0	19.0	5.5	8.0
Lebanon	10.0	5.0	5.0	5.0	6.0
Syria	38.3	23.7	25.0	24.0	25.0
Total	70.0	42.2	63.5	39.3	55.0
Africa					
Algeria	5.2	10.4	8.0	4.0	8.0
Egypt	6.0	8.0	8.0	8.0	6.5
Libya	.9	2.0	1.8	1.5	1.5
Morocco	35.2	32.4	54.8	50.3	56.6
Tunisia	5.2	7.5	8.0	10.0	8.0
Total	52.5	60.3	80.6	73.8	80.6
Other	9.3	9.1	9.4	10.2	9.8
Grand total	629.6	680.9	716.0	669.3	785.4

[1] Preliminary.

Source: International Olive Oil Council, Madrid, and the Foreign Agricultural Service, USDA.

Table Olives: World Exports, Marketing Years 1974/75-1978/79

(In 1,000 metric tons)

Area and country	Years beginning Nov. 1				
	1974/75	1975/76	1976/77	1977/78	1978/79[1]
North America					
Mexico	—	—	—	—	—
United States	1.7	1.6	1.6	3.0	3.0
Total	1.7	1.6	1.6	3.0	3.0
South America					
Argentina	11.9	21.5	14.6	16.0	17.0
Brazil	—	—	—	—	—
Chile	.5	.5	—	—	—
Peru	—	—	—	—	—
Total	12.4	22.0	14.6	16.0	17.0
Europe					
Cyprus	—	.1	.1	.1	.2
France[2]	2.4	2.5	3.0	2.5	3.4
Greece	29.9	33.6	38.0	39.5	45.5
Italy	.7	.5	.5	1.1	1.0
Portugal	2.3	2.1	3.2	2.5	2.5
Spain	55.9	83.1	65.5	80.0	85.0
Turkey	.7	.8	5.0	3.0	10.0
Yugoslavia	—	—	—	—	—
Total	91.9	122.7	115.3	128.7	147.6
Middle East					
Israel	.5	—	.1	.4	1.8
Jordan	1.2	—	1.0	—	—
Lebanon	.1	—	—	—	—
Syria	9.0	—	—	—	—
Total	10.8	—	1.1	.4	1.8
Africa					
Algeria	3.5	5.4	5.0	.8	4.2
Egypt	—	—	—	—	—
Libya	—	—	—	—	—
Morocco	18.9	24.5	48.3	36.2	34.0
Tunisia	.7	.8	2.0	.6	1.0
Total	23.1	30.7	55.3	37.6	39.2
Other	.3	.3	.4	.3	.3
Grand total	140.2	177.3	188.3	186.0	208.9

— Indicates negligible or none.

[1] Forecast. [2] Most exports represent transhipments.

Source: International Olive Oil Council, Madrid, and the Foreign Agricultural Service, USDA.

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